Determining Hospital Ship (T-AH) Staffing Requirements for Humanitarian Assistance Missions

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Summary

Problem

The primary mission of the hospital ship is to provide acute medical and surgical services to forces ashore and afloat during military operations. In addition, the hospital ship also has the mission of providing a hospital asset in support of disaster relief (DR) and humanitarian assistance (HA) operations all over the world. This secondary mission requires the hospital ship to provide medical care to a different population with a set of medical conditions not necessarily seen during combat casualty care, thus affecting the manning requirements.

Objective

To better plan the medical response to HA/DR scenarios, knowledge of the mission requirements and the anticipated patient workload is required. With this information the appropriate mix of personnel, supplies and equipment can be projected. The goals of this project were to gather subject matter expert (SME) data, medical treatment data, and medical mission support information to determine the optimal staffing mix (military/civilian, nongovernmental organization) aboard the hospital ship during HA/DR missions.

Approach

Information and data from a variety of sources were used to better understand humanitarian missions conducted by the military, specifically the hospital ships. Factors such as time on site, security threats present, and location characterize the mission. Patient encounter data from previous missions were used to determine expected patient conditions encountered in various humanitarian operations. Support task information was gathered from SMEs. These data points were used to project the medical and support tasks required for future missions.

Results

There is no "one size fits all" staff solution for HA missions. The staffing recommendation outlined in this report is the minimum medical staff needed to perform an HA mission based on staffing ratios and lessons learned from the past two USNS *Mercy* HA missions. To conduct a successful HA mission on a hospital ship caring for surgical patients, outpatients ashore, and limited capacity-building activities, a minimum staff of 228 medical and 288 nonmedical personnel would be required.

Conclusion

To accomplish a successful HA mission, the operational requirements and goals must be set ahead of time. The expected patient conditions and the time at each site, which constrain the types of medical interventions possible, determine the best medical specialties to embark. Humanitarian missions accomplish more than just the number of patients seen—effective HA helps build the health care infrastructure so that nations can become self-sufficient.

Background

Peacekeeping, disaster relief (DR), and humanitarian assistance (HA) operations are integral to two US military strategy foundations: (1) forward presence, and (2) crisis response. The Health Service Support requirement is a major factor in these circumstances, and Navy medical units are required to make rapid deployments to varied geographical areas–often where the medical infrastructure of a host nation's (HN) may be overwhelmed or in chaos. Planned HA missions have been and continue to be a part of geographic combatant commanders' theater security cooperation plans (TSCPs), but the hospital ships' use in this role is new. How to plan for and respond to humanitarian assistance and disaster relief (HA/DR) missions is a complex issue since planners and logisticians strive to maintain operational readiness.

As part of Operation Unified Assistance to provide relief and HA following the devastating December 2004 earthquake and tsunami, the US Navy hospital ship USNS *Mercy* was deployed to the Indian Ocean region. More than 500 US Navy and Project HOPE medical staff, uniformed US Public Health Service (USPHS) members, and Navy support personnel were aboard *Mercy*. While in the region, *Mercy* also conducted HA in East Timor and, following an earthquake on March 30, 2004 was requested to provide DR to Nias Island, Indonesia. Overall, *Mercy* treated more than 17,500 patients ashore and afloat in Banda Aceh, Indonesia, Dili, East Timor, and Nias Island. These HA/DR missions were conducted in cooperation with HN governments and demonstrated the United States' continuing commitment to the region's stability and security.[1]

Initially, *Mercy* medical staff conducted medical and dental assistance programs ashore and afloat in Banda Aceh, treating more than 9500 patients and performing 19,512 medical procedures, including more than 285 surgical and operating room cases. These medical and dental services included neurology, optometry, ear, nose, and throat (ENT), obstetrics and gynecology, urology, pediatrics, primary and acute care, mental health, orthopedics, ophthalmology, immunizations, radiology, laboratory, pharmacy, dental extractions, pediatric surgery, general surgery, and plastic surgery. US military medical providers and Project HOPE personnel also provided public health training ashore and afloat.[1]

During the ship's 2-day visit to Dili, East Timor, *Mercy's* combined military and civilian medical staff saw more than 1800 patients. This visit was conducted in cooperation with the government of East Timor as a part of a TSCP. *Mercy* medical and support teams provided HA and medical care to local residents at a number of locations. Over 70 medical personnel provided primary care, pediatric, dental, and optometry services, repaired medical equipment, taught preventive and general health classes at local schools, and conducted environmental health operations. In addition, *Mercy's* Navy, nongovernmental organization (NGO), and a civilian mariner crew engaged in a number of projects around the island from classroom repair to plumbing.

After an 8.7-magnitude earthquake struck the island of Nias, *Mercy* was called to provide DR to those affected.[1] *Mercy* provided assistance to international relief organizations and HN medical teams ashore. As the only Level 3 trauma hospital in the vicinity, *Mercy* staff

evacuated 94 of the most seriously injured and ill patients via helicopter to the ship, where doctors and medical personnel performed 123 surgeries and 19,311 medical procedures.

Ashore, medical teams performed 2149 dental procedures and distributed 2577 pairs of glasses to the people of Nias. Preventive medicine (PM) teams and USPHS personnel traveled across the island testing drinking water, spraying for mosquitoes, and training local teams in mosquito and insect control. Personnel from *Mercy* and combat store ships USNS *Niagara Falls* and USNS *San Jose* repaired equipment in a local pharmacy, school library, and nursing school dormitory.

Unified Assistance Impact

The February following the 2004 tsunami, Terror Free Tomorrow, a nonpartisan, nonprofit polling organization that seeks to understand supporters of global terrorism,[2, 3] conducted surveys in Indonesia, the world's largest Muslim country. Results indicated a positive shift in public opinion toward the US global war on terror. Key poll findings included:

- More people favored than opposed US-led efforts to fight terrorism (40% to 36%).

- Diminished support for Osama Bin Laden (58% favorable to 23%).

- 65% of Indonesians felt more favorable toward the United States due to our tsunami response.

The survey's critical implications for the United States were:

- Our actions can make a significant and immediate difference in minimizing the support base for global terrorists.

- We must sustain relief and disaster efforts in Indonesia to prevent the support base from eroding.

- The size and strength of support can dramatically change in a short period of time.

In general, HA, as a part of the TSCP, fosters goodwill, furthering US national interests.[4] Key reasons to engage in HA missions are to build indigenous capabilities and cooperative relationships, keep forces forward deployed, provide training and readiness benefits, and promote peace and stability. HA missions also help develop cooperative relationships and sensitivity to other cultures, which is necessary during stability, security, transition and reconstruction (SSTR) operations. SSTR operations, recently recognized in Department of Defense (DoD) directive 3000.05,[5] often include HA. While Directive 3000.05 does not directly call for HA, it mandates that the military be trained and prepared to execute HA missions at any time. The hospital ships offer a platform with a wide range of medical capabilities for medical HA or DR, which are their secondary missions. Because the hospital ships are considered for more routine HA missions, delivering effective assistance is the goal. Direct patient care can positively affect the patients seen, but the hospital ship platform can also support capacity-building projects. These projects have positive long-term implications for HNs and are a cost-effective method of delivering substantive medical care.[6]

2006 *Mercy* HA Mission

As part of the US Pacific Command (PACOM) TSCP 2006, *Mercy* deployed for humanitarian and civic assistance to the Philippines, Bangladesh, Indonesia, and East Timor in May 2006 (see Figure 1 for a mission map). *Mercy* was charged with demonstrating US compassion, commitment, and support to the Pacific region by providing highly valued medical services and HA to underserved populations in the area. Essential tasks for the mission included providing:

- medical care in concert with HN requests and platform capabilities,

- NGO/military integration,

- force protection,

- a Command and Control (C2) organization and communications network,

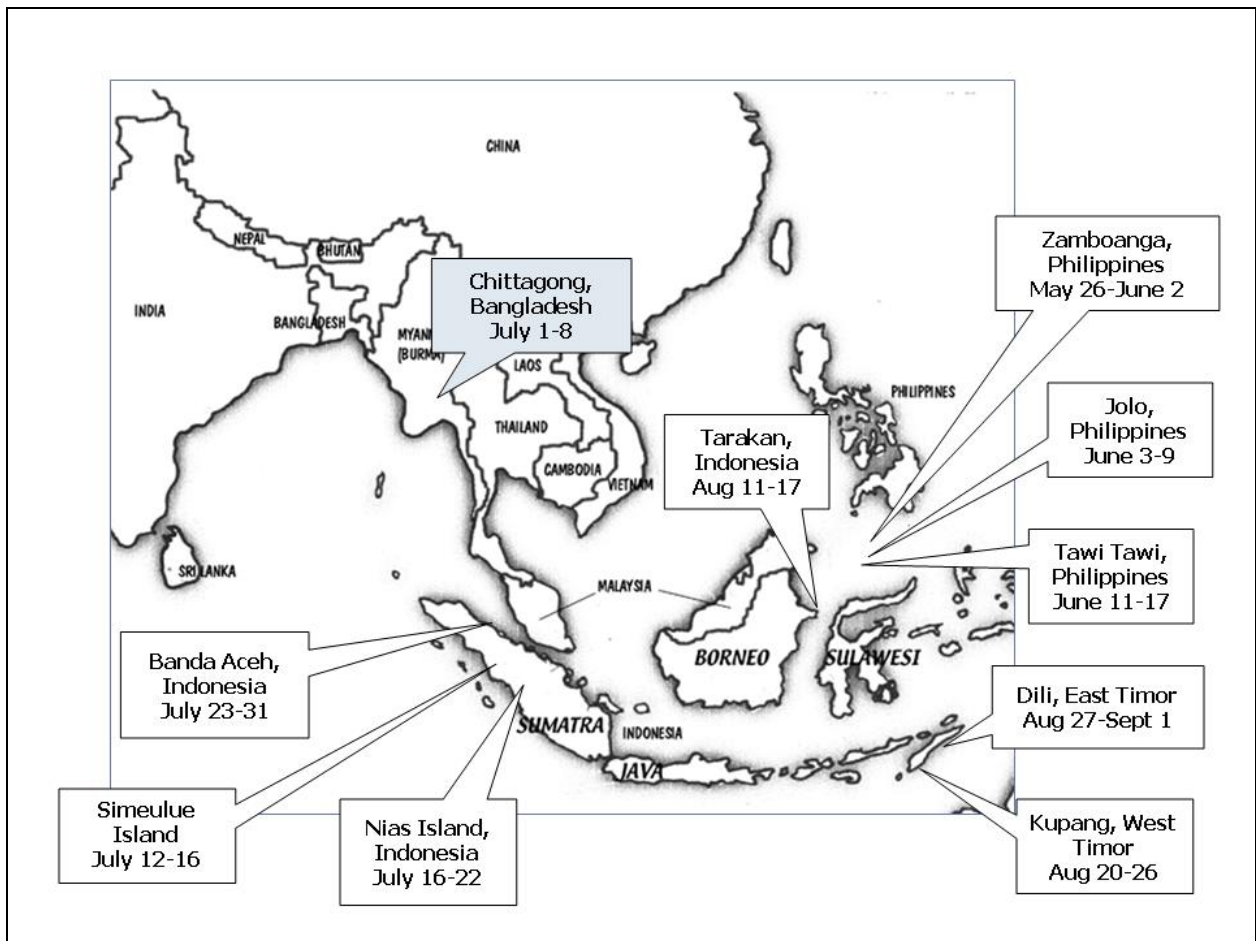- ship-to-shore movement, and

- public affairs interaction.

Figure 1. Locations served by the USNS *Mercy*.

Mercy provided medical, surgical, and dental services and education; sanitation and hygiene training; veterinary services and training; BMET; installation and training; and minor facility construction and improvements.

Problem

The current manning levels and equipment/supplies are designed for the primary mission of combat casualty care. When an HA mission is deployed, planners are left without clear guidelines as to how best to staff the hospital ships. This is further complicated by the cooperative nature of working with NGOs, since it is difficult to predict how many providers and what specialties will supplement the US military medical staff. If the hospital ships are to be used for routine HA, staffing requirements specific to this type of mission need to be established. This is especially true in our current climate, where medical staff are in high demand due to the stress of other military commitments.

To address this issue, a few months after *Mercy's* return from the 2005 tsunami relief mission, the Naval Health Research Center (NHRC) was tasked with determining the optimum mix of active-duty and NGO personnel required to perform HA. A statement of work was developed, and research into previous HA missions and medical outreach began. Previous studies conducted by NHRC[7, 8] sought to determine the patient conditions (PCs) encountered during humanitarian missions. Unfortunately, patient encounter data are not collected for most missions, and information about the quantity and type of staff performing the work is not readily accessible. Understanding the medical needs of the population, another underreported and unmined data area, is imperative to determine medical staff requirements. To address this issue, NHRC's goal was to collect patient encounter data to determine the:

- types of medical conditions seen,

- level of medical and surgical intervention,

- medical tasks performed, and

- quantity of medical staff and specialties used afloat and ashore.

From this information, the required medical skill sets to successfully accomplish an HA mission can be identified.

Approach

Data Collection

As *Mercy* began preparations for the 2006 HA mission, NHRC assisted with patient encounter and staffing data collection to help determine HA staffing requirements. Carbonless, two-part patient encounter forms were developed by NHRC with subject matter expert input. The forms were designed to quickly gather minimal information that characterized the patient types seen during the mission. The provider names were solicited to determine which provider specialties were utilized. The patient encounter forms can be

found in Appendix A. Laptops with an Access database that corresponded with the patient encounter forms were provided to *Mercy*. The database contained queries and reports that would allow *Mercy* to detail the number of patients seen each day, classified by *International Classification of Diseases*, Ninth Revision (ICD-9) category. Once *Mercy* returned to San Diego, the data would be given to NHRC for analysis. NHRC also suggested nursing or medical specialty data be collected for NGO personnel to determine how and where these volunteers were utilized. From the proposed data collection effort, NHRC hoped to both characterize the patients seen and analyze the use of NGO personnel to help determine future HA staffing requirements.

Mercy's medical leadership changed its strategy en route to the Philippines. The Battlefield Medical Information System Tactical and Composite Health Care System II-T data collection systems were selected to replace NHRC's patient encounter forms and associated database. The use of these systems was discontinued during the initial site visit.

Despite a change in collection methods, *Mercy* maintained some data in several reporting spreadsheets. NHRC obtained a level-of-effort spreadsheet, which contained the patient counts for each department/division by location. A log of surgical patients seen aboard *Mercy* from May through July 2006 and a spreadsheet that contained the location and diagnosis for patients seen at ashore sites were made available. While the lack of individual encounter data by day, and the standardization of data collection were not ideal for NHRC's analyses, the available information was sufficient to allow substantive HA staffing recommendations.

Analysis Methodology

NHRC used the logical framework process (LFP) suggested by Drifmeyer in 2004[9, 10] to analyze the collected data and determine the HA staffing and skill set requirements. Ideally, the LFP would be used prior to an HA mission to guide planning and predetermine clear goals. The 2006 *Mercy* HA mission was obviously conducted without an LFP, however the nature of the process lends itself to historical application.

Briefly, the first step of the LFP is to formally state the mission's goals, objectives, activities, inputs, and outputs. This high-level planning process is diagramed in Figure 2. Questions posed in the initial planning stages may include: What are the goals of the mission, and therefore, what services will be offered to an HN—direct patient care and/or capacity-building? What are the HN's needs? What assistance can the hospital ship offer that meets the needs of the HN and meets the resource/time constraints of the military? Follow-on questions that will have an impact on planning include:

- What ship platform will be used?

- What length of time will the ship be deployed at the location?

- What facilities are available if personnel stay ashore?

- Will personnel be at more than one site?

- What type of services can be offered?

HA Planning —
Determining Medical and Support Staff Requirements

Operation planning factors

- Ship platform (T-AH, LSD, LPD, CVN)
- Length of deployment & average length of stay at each site
- HN medical needs
- Security & support personnel requirements

Patient Info
Expected patient conditions

Capabilities & Services
Direct patient care
Capacity building

Shipboard &/or Shore
based care

Available resources **+** Tasks performed

Medical staff quantity & required skill sets
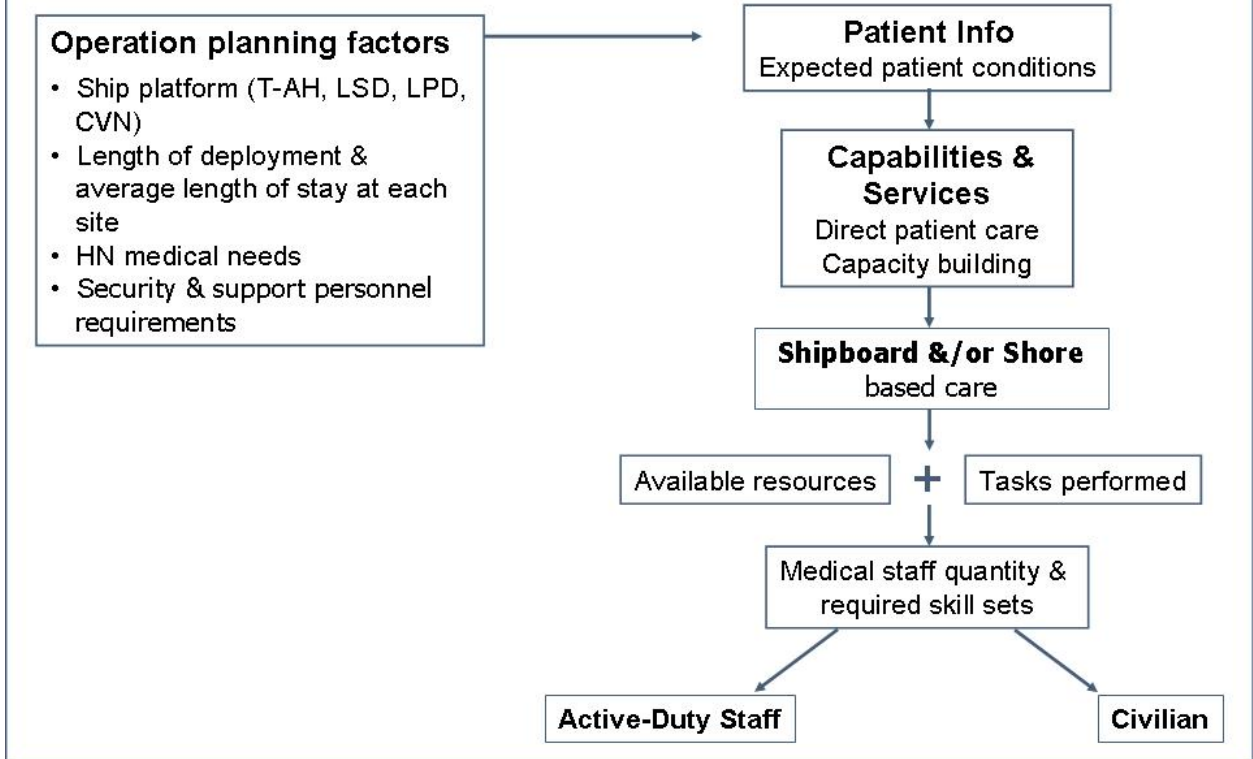
Active-Duty Staff   **Civilian**

Figure 2. HA medical and support staff requirements planning model.

Once the operational planning factors are determined, research into what PCs are expected in the planned HNs will further influence the capabilities and services offered during the HA mission. Within this framework, the mission's expectations and goals are continually refined, making the selection of medical providers, capacity-building personnel, and support staff easier to define. For a training objective, the personnel may include physicians, nurses, corpsmen, and PM personnel. For a capacity-building construction project, a construction detachment may be requested. Direct patient care (surgical or primary acute care) will require a mix of physicians, nurses, and corpsmen. Medical equipment repair/installation projects will require biomedical equipment repair technicians. The logistics and force protection personnel requirements are greatly dependent on knowing as much as possible about the various sites where the services will be performed. The number of translators available may also limit the site operations planned.

The available resources of the chosen ship platform (*Mercy*) and ashore HN facilities, combined with the selected tasks to be performed, allow a refined estimation of the quantity and types of medical staff necessary to accomplish the HA mission.

The follow-on LFP steps focus on assessing the assistance provided and measuring the mission's success. While outcome measures are not directly related to determining the staffing, following all the steps of the LFP may lead to a change in the staff for future

missions. The next step is to define the variables to be measured and their relationship to each other. Suggested variables to be measured for hospital ship HA missions are the potential number of patients served before and after the installation or repair of a piece of equipment, number of people with access to clean water, or the number of people with access to certain services after training is completed. The final step of the LFP is to ensure that the intended outcomes are achieved. Documenting the work completed and archiving it where the information can be accessed prior to follow-on missions and planning future missions at the same location is one way to achieve the intended outcomes.

Once the mission was framed using the LFP, the schema in Figure 3 was created as the basic outline for determining HA staffing and skill set requirements, including transit, ashore, shipboard, capacity building and support personnel.

Transit to site staff
Direct patient care ashore staff (clinical and ancillary)
Capacity-building staff
        Training
        Preventive medicine
        Biomed repair
        Construction battalion
  Direct patient care shipboard staff (surgical and ancillary)
+ Support staff
_____
  Required hospital ship staff

Figure 3. HA staff recommendation schema.

There are several parts to an HA mission, and the staffing requirements are unique to each segment. The basic manning flow for hospital ship HA mission requirements include transit personnel, personnel for direct patient care ashore and afloat, capacity-building personnel, and support staff. These categories are not exclusive, as was the case on *Mercy*. Transit personnel participated in the delivery of the HA once on site. The personnel providing training also participated in patient care activities. The transit personnel are a subset of medical personnel who prepare the ship for patients and provide medical care while the ship is in transit to the HA location. The majority of the medical personnel met up with the ship a week prior to the actual delivery of HA and returned to their sourcing medical treatment facilities (MTFs) as the ship returned to its homeport.

With this framework in place we could then look at the data captured by *Mercy* during the summer 2006 mission. When analyzing the results, all data were categorized into one of the above staffing areas, and the ensuing numbers were used as an outline for staffing suggestions.

Results

The data presented were taken from several spreadsheets provided to NHRC by *Mercy*. The majority of the patient data were from a level-of-effort spreadsheet, which contained the patient counts for each department/division by location. A log of surgical patients seen

aboard *Mercy* from May through July 2006 was also given to NHRC. Lastly, a spreadsheet containing the location and diagnosis for patients seen at the mission outreach sites was given to NHRC. The lack of individual encounter data by day and the standardization of data collection limited the analysis performed by NHRC. Staff data were from a database maintained by the USNS *Mercy* administrative department.

The results of the data collected by the USNS *Mercy* yielded two data sets: (1) workload data, and (2) staffing data. The workload data are presented first. This dataset can be categorized by where the work took place—ashore or aboard the ship. Ashore activities included direct patient care and capacity building. There were two types of patient care: (1) patients seen at a typical medical outreach, and (2) patients seen at a HN medical facility. Capacity-building activities included training, biomedical equipment repair services, PM surveys, and minor facility construction or repair. Shipboard activities were exclusively comprised of surgical patients. The staffing data were categorized by the various functional areas on the ship or teams of personnel who performed the activities ashore. The personnel were further divided by active-duty military or NGO civilians.

Workload Data

Workload data allows researchers and planners to understand various elements that have a direct impact on staffing and supplies, including what types of illnesses were seen and in what quantity, how many patients were treated, and what types of PCs were most common. The amount of time devoted to a specific patient is directly related to the diagnosis and will determine what medical staff numbers and specialties should be present on a typical HA mission. While the data from *Mercy* were somewhat specific to the geographical location of the mission, it gave a baseline for future staffing and supply planning.

Patient Care Ashore

Mercy provided a spreadsheet that included the location, age, gender, and primary diagnosis of patients seen at medical outreach missions during the deployment. NHRC personnel assigned an ICD-9 category based on the primary diagnosis recorded (see Table 1).

Table 1.
Medical Outreach Patient Diagnosis by ICD-9 Category and Location

ICD-9 Category	Zamboanga	Tawi-Tawi	Jolo	Simeulue	Nias	Banda Aceh	Kupang	Tarakan	Dili	Total Count	Patients (%)
Infectious and parasitic diseases	20	112	43	24	48	34	117	161	2	561	6
Neoplasms	1	11	4		1	3	28	27		75	<1
Endocrine, nutritional & metabolic diseases, and immunity disorders	6	44	11	20	17	18	93	79	4	292	3
Blood & blood-forming organs diseases			1					1		2	<1
Mental disorders		2		1	2	2	5	6	1	19	<1
Nervous system & sense organs diseases	8	48	26	18	18	25	43	54	4	244	3
Circulatory system diseases	9	24	9	23	26	28	72	138	5	334	4
Respiratory system diseases	58	342	273	84	160	89	349	515	24	1894	20
Digestive system diseases	8	74	33	51	93	43	235	207	36	780	8
Genitourinary system diseases	5	65	24	14	16	22	96	226	9	477	5
Skin & subcutaneous tissue diseases	15	54	17	17	35	18	68	159	6	389	4
Musculoskeletal system & connect tissue diseases	6	84	46	92	193	83	232	269	12	1017	11
Congenital anomalies			1		2	2	3	9	5	22	<1
Certain conditions originating in the perinatal period											
Symptoms, signs, & ill-defined conditions	1	219	147	55	147	80	244	206	9	1108	12
Injury and poisoning	4	23	18	15	19	14	47	56	2	198	2
Complications of pregnancy, childbirth, & the puerperium											
No Code Assigned	415	357	87	80	62	69	329	393	304	2096	22
Total patients seen at each site	**556**	**1459**	**740**	**494**	**839**	**530**	**1961**	**2506**	**423**	**9508**	**100**

In some cases a diagnosis was not recorded (only symptoms), and a best attempt was made to identify an ICD-9 category. If the terminology used could not be discerned or an abbreviation could not be determined, then no code was assigned. As to be expected, every site had uncoded records, though Zamboanga and Dili had the highest proportions of uncoded records. The patient encounter data for Jolo, Simeulue, Nias, and Banda Aceh indicate most patients presented with respiratory and musculoskeletal system diseases and various ill-defined conditions. In Tawi-Tawi, respiratory diseases and ill-defined conditions were the top two categories, but more patients suffered from infectious and parasitic than musculoskeletal diseases. Again, in Kupang, respiratory system diseases and ill-defined conditions were seen most often. About the same numbers of patients were seen with digestive system diseases (n=235) and musculoskeletal system diseases (n=232) in Kupang. In Tarakan, respiratory system diseases were most abundant, followed by musculoskeletal and genitourinary system diseases.

Overall, diagnoses categorized as respiratory system diseases were the most common (20%) across the different locations. Patients with symptoms, signs, and ill-defined conditions made up 12% of those seen at the outreach sites, followed by 11% with musculoskeletal system and connective tissue diseases.

Almost one quarter (22%) of the medical outreach patients did not have an ICD-9 code. Reasons for missing ICD-9 codes included a lack of standardized terminology or abbreviations therefore making interpretation confusing or impossible, illegible recorded data, or patients received physical exams or immunizations, which should be classified with a procedure code. The high percentage of patients with no ICD-9 code highlights the need for an electronic patient data system that can be used ashore by hospital ship personnel. The system would aggregate data for easy daily situation reporting.

Figure 4 presents patients treated by *Mercy* personnel at HN local hospitals. Just over 19,000 patients were seen at local facilities. The majority (73%) of the patients were seen by Primary Care personnel. Only 20% of the patients were Pediatric. Orthopedics and Mental Health each saw about 350 patients (2%), while Ophthalmology, OB/GYN, Urology, and ENT each saw less than 300 patients. The number of days spent at each location and the number of providers varied, which has a direct impact on the each specialty's workload.
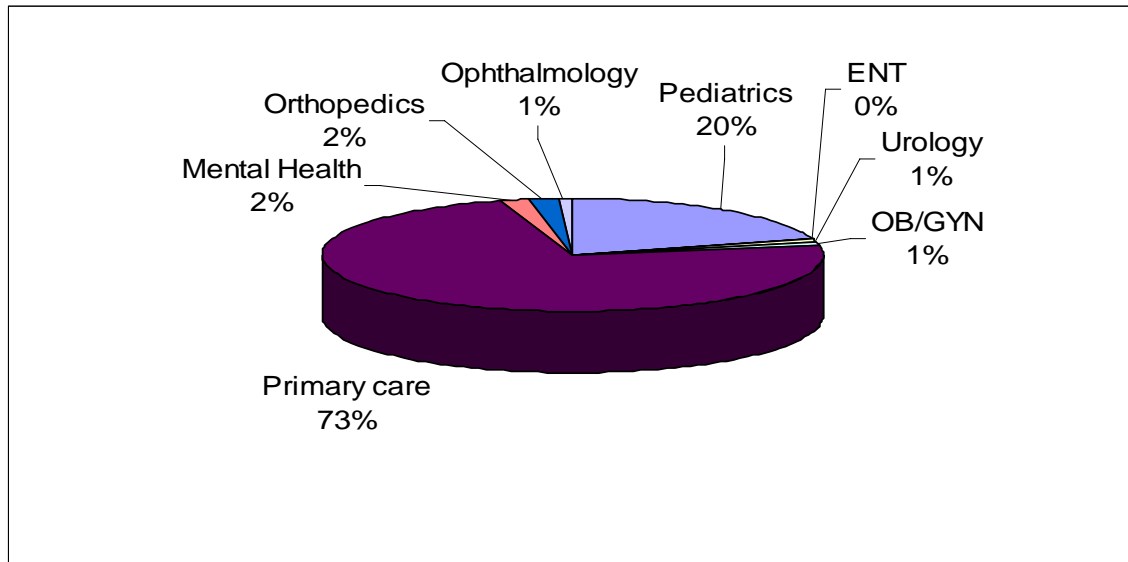
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Figure 4. Host nation medical treatment facility patient data by clinical specialty

Capacity-Building Activities

Capacity-building activities can have a lasting impact on the communities and populations served. They tend to be somewhat overlooked as an HA mission goal, since the work and results are not dramatic or easily quantifiable. The impact of education and physical improvements to the existing infrastructure will continue to serve the population long after the HA ship has departed, and will improve the overall health of the community. Because the HA missions are very short-term, it is important to provide as much capacity-building assistance as possible.

Mercy outreach included facility and equipment improvements and repair, general and preventative medicine training classes, and environmental health assessments. General health classes were given on topics such as nutrition, obstetric emergencies, neonatal advanced life support, pediatric advanced life support (PALS), physical therapy, community health, patient safety, infection control, pediatrics, venipuncture, EKG, diabetes, IV, and wound care. Popular PM training courses were disease vector control, water sanitation and testing, infection control, personal hygiene, malaria, and laboratory procedures. Table 2 shows the total number of students trained by site. Data were not available by class or by day.

Table 2.
Number of Students Trained at Each Site in Various Topics

	Zamboanga	Jolo	Tawi-Tawi	Chittagong	Simeulue	Nias	Banda Aceh	Tarakan	Kupang	Dili	Total	%
ALS	191	47	219	14	89	94	51	109	124	24	**962**	11
General Classes	197	0	131	1670	74	126	278	732	609	73	**3890**	46
Health promotions	0	0	0	14	115	257	115	88	253	16	**858**	10
Biomed repair training	16	4	0	12	2	12	156	4	46	2	**254**	3
Prev med training	140	1557	40	67	5	346	197	18	95	114	**2579**	30
Training totals	**544**	**1608**	**390**	**1777**	**285**	**835**	**797**	**951**	**1127**	**229**	**8543**	**100**

Table 3 shows the number of biomedical equipment repairs performed at each location.

Table 3.
Number of Biomedical Equipment Repairs Performed at Each Site

	Zamboanga	Jolo	Tawi-Tawi	Chittagong	Simeulue	Nias	Banda Aceh	Tarakan	Kupang	Dili	Total
Biomed repairs	27	34	53	13	14	19	11	44	13	8	236
Misc	8	6	0	24	7	9	14	0	10	3	81
Biomed totals	**35**	**40**	**53**	**37**	**21**	**28**	**25**	**44**	**23**	**11**	**317**

As determined by *Mercy's* lessons learned conference, the most common equipment items repaired were x-ray machines, ultrasounds, EKG, and anesthesia machines. In addition, four donated dental chairs were installed in Banda Aceh.

Preventive medicine activities varied based on security force availability and HN requests. The bulk of the Preventive Medicine Detachment mission was to provide training to HN public health professionals. In addition to training, the team conducted environmental health assessments of MTFs where *Mercy* was providing medical services. Table 4 shows the quantity and type of PM activities conducted at each site.

Table 4.
Preventive Medicine Activities by Site

	Zamboanga	Jolo	Tawi-Tawi	Chittagong	Simeulue	Nias	Banda Aceh	Tarakan	Kupang	Dili	Total	Activities (%)
Food Service Inspections	5	4	0	1	0	1	2	1	3	1	**18**	1
Environmental survey assessments	33	11	22	32	7	22	11	16	6	1	**161**	9
Field sanitation inspections	5	12	22	0	2	3	0	0	2	1	**47**	3
General sanitation inspections	40	41	10	31	4	1	0	0	3	1	**131**	7
Pest control	27	14	3	60	3	4	8	3	4	5	**131**	7
Pest surveillance	7	8	18	49	7	14	8	9	6	4	**130**	7
Entomology	307	32	63	111	20	84	33	28	1	152	**831**	46
Industrial hygiene	38	17	0	1	0	6	0	0	0	1	**63**	4
Environmental health	30	32	13	5	11	17	0	3	16	3	**130**	7
Environmental engineering	37	88	19	0	1	2	1	2	4	1	**155**	9
											1797	100

Shipboard Surgical Patients

Due to security reasons, a few medical outreach missions were conducted on board the ship, however the majority of the shipboard activities were surgical interventions. HN personnel from local hospitals referred surgical patients to *Mercy*, then personnel aboard ship screened the patients and determined the patient load based on need, resources, and time available. Table 5 displays the patient counts for cases screened by *Mercy* personnel, and Table 6 shows the surgical patient counts aboard ship by location.

Table 5.
Number of Patients Screened for Surgery by Location

Type of Surgical Screening	Zamboanga	Jolo	Tawi-Tawi	Chittagong	Simeulue	Nias	Banda Aceh	Tarakan	Kupang	Dili	Total	Surgical patients (%)
Pediatric	524	12	188	106	20	102	12	40	90	50	**1144**	22
General	1197	159	352	118	86	563	374	303	403	251	**3806**	71
Plastic surgery	4	2	0	271	3	0	6	0	0	0	**286**	5
Oral Maxillofacial	0	0	9	57	11	3	0	8	0	3	**91**	2
Total per location	**1725**	**173**	**549**	**552**	**120**	**668**	**392**	**351**	**493**	**304**	**5327**	**100**

Table 6.
Number of Surgical Patients Aboard *Mercy* by Location

Location	Zamboanga	Jolo	Tawi-Tawi	Chittagong	Simeulue	Nias	Banda Aceh	Tarakan	Kupang	Dili	Totals
No. of surgeries	89	82	61	56	46	84	84	75	72	39	688
Percent	13	12	9	8	7	12	12	11	10	6	100

Table 7 provides a quick overview of all surgical patients from May to July 2006. Data were not available for surgeries performed in Tarakan, Kupang, and Dili. There were slightly more male than female surgical patients. Children (0-19 years) accounted for 37% of the surgical patients and adults (>20 yr) were 63%. Approximately 20% of the patients had more than one surgical procedure performed. Most patients had two attending surgeons and received general anesthesia during their procedure.

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Table 7.
General Characteristics of Surgical Patients Aboard *Mercy*, May-July 2006

Characteristic	No.	%
Gender		
Female	238	47.4
Male	264	52.6
Age, y		
0–4	86	17.1
5–9	44	8.8
10–19	56	11.2
20–29	55	11.0
30–39	67	13.4
40–49	76	15.2
≥50	117	23.4
Unknown	1	0.2
No. surgical procedures per patient		
1	397	79.1
2	75	14.9
3+	25	5.0
Unknown	5	1.0
No. attending surgeons per patient		
1	214	42.6
2	243	48.4
3+	45	9.0
Anesthesia type (primary)		
General	403	80.3
Intravenous conscious sedation	1	0.2
Local	44	9.0
Monitored anesthesia care	1	0.2
Peripheral nerve block	1	0.2
Characteristic		
Retrobulbar block	36	7.2
Spinal	15	3.0

Figure 5 summarizes the ICD-9 category for the primary diagnosis among surgical patients treated aboard the USNS *Mercy* during the HA mission, May–July 2006. Seventy-one percent of the surgical patients fell into one of four categories: congenital anomalies (20.9%), endocrine, nutritional and metabolic diseases and immunity disorders (18.1%), digestive system diseases (16.1%), and nervous system and sense organ diseases (15.9%).

ICD-9 Categories for Surgical Patients
May-July 2006
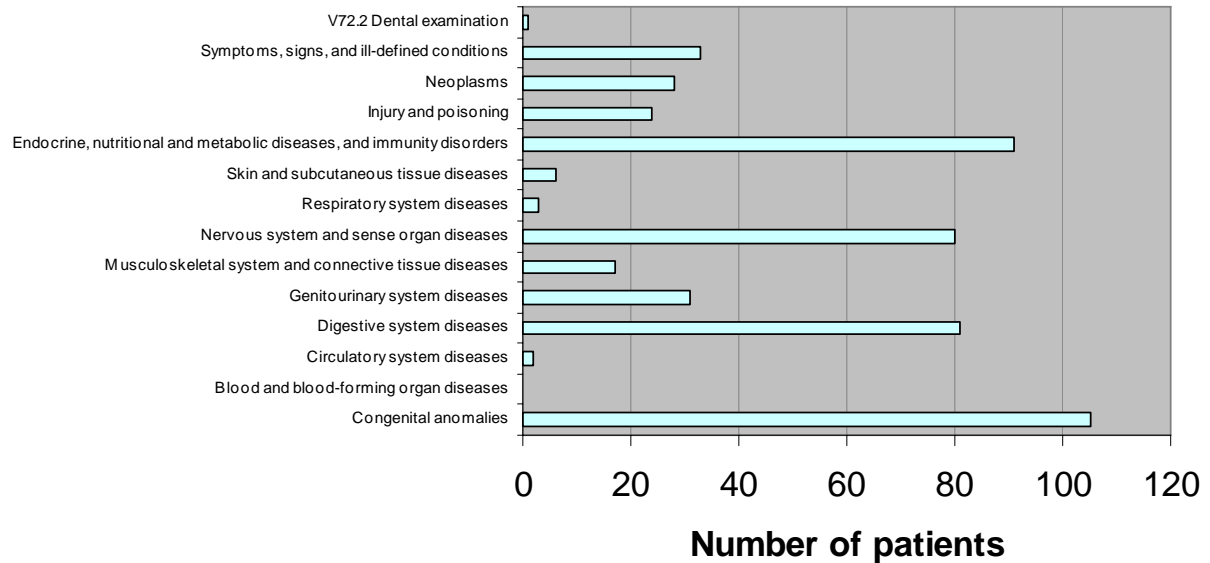
Figure 5. ICD-9 categories for surgical patients May-July 2006 aboard USNS *Mercy*.

Table 8 indicates the specialties that performed the most surgeries at each location, highlighted in red. Most surgical procedures were performed by general surgeons. Operation Smile embarked for the Bangladesh portion of the mission and focused on cleft palate/cleft lip repair surgeries.

Table 8.
Surgical Specialties Used by Location

Surgical specialty	Zamboanga (n = 89)		Jolo Island (n = 82)		Tawi-Tawi (n = 61)		Bangladesh (n = 56)		Simeulue (n = 46)		Nias (n = 84)		Banda Aceh (n = 84)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Dental		(0)	0	(0)	0	(0)	0	(0)	0	(0)	2	(2.4)	0	(0)
General medical	4	(38.2)	46	(56.1)	28	(45.9)	0	(0)	17	(37.0)	37	(44.0)	23	(27.4)
Gynecology		(3.7)	3	(3.7)	4	(6.6	0	(0)	1	(2.2)	11	(13.1)	5	(6.0)
Ophthalmology	8	(20.2)	6	(7.3)	4	(6.6)	0	(0)	17	(37.0)	18	(21.4)	22	(26.2)
Orthopaedic		(2.2)	2	(2.4)	5	(8.2)	0	(0)	0	(0)	7	(8.3)	11	(13.1)
Otolaryngology		(1.1)	5	(6.1)	4	(6.6)	0	(0)	1	(2.2)	0	(0)	0	(0)
Pediatrics	2	(13.5)	5	(6.1)	5	(8.2)	1	(1.8)	2	(4.3)	2	(2.4)	7	(8.3)
Plastic surgery	10	(11.2)	12	(14.6)	7	(11.5)	54	(96.4)	5	(10.9)	6	(7.1)	11	(13.1)
Urology		(7.9)	3	(3.7)	4	(6.6)	1	(1.8)	3	(6.5)	1	(1.2)	5	(6.0)

Personnel Data

One goal of the data collection effort was to collect the patient encounter data during the HA mission to determine the medical skill sets required. The tables in this section show which personnel were deployed during the 2006 HA mission and what activities or functional areas were utilized. One limitation of the analyses is that we do not know whether the type of personnel deployed determined the type of care given, or whether the PCs represented the medical needs of the population.

A summary of the ashore workload along with the number of personnel assigned to work ashore is presented in Table 9. Presumably, more staff ashore would mean an increase in the number of patients seen, but this was not always true. It is difficult to determine why some sites had a large number of patients seen with fewer staff ashore and others with a large staff treated relatively few patients. Factors such as location, other available care, population at the location, and advertising may influence the number of patients who seek care at the medical outreach sites.

Table 9.
Summary of Ashore Workload and Manpower

	Zamboanga	Jolo	Tawi Tawi	Chittagong	Simeulue	Nias	Banda Aceh	Tarakan	Kupang	Dili
# of medical outreach patients	556	740	1459		494	839	530	2506	1961	423
# of medical staff at medical outreach	*	12	33		18	229	1101	669	99	332
# of dental patients	830	575	560	174	399	432	373	658	937	253
# of dental personnel	*	16	22	*	21	331	554	228	39	222
# of optometry screenings	2136	1983	1810	26	1387	22161	33422	22650	2849	1710
# of optometry personnel	*	12	16	*	10	117	226	116	20	112
# of immunizations given	90	57	81	0	2822	33433	11918	22370	6533	22071
# of immunization personnel	*	4	4		35	336	444	337	56	114

The patient numbers for medical outreaches were taken from the outreach patient spreadsheet. Patient numbers for Optometry, Dental, and Immunizations were taken from the level-of-effort spreadsheet. Additional Optometry, Dental, and Immunization patients were seen by *Mercy* personnel at HN facilities and not recorded separately. The number of personnel assigned for each functional area was from mission briefing slides. For optometry,

dental, and immunizations the number of personnel for the functional area was summed across the different missions (medical outreach + HN facilities) each day at each site.

Surgeries were performed aboard *Mercy* and at the HN's local facilities by *Mercy* providers. Table 10 summarizes the number of surgeries performed with the number of staff assigned to the surgical department.

Tables 9 and 10 summarized the workload alongside the manpower assigned. One might expect if more providers are available then more patients will be seen. That hypothesis is not always true. Many factors affect the number of patients seen. The number of personnel is not the only constraint on the surgical workload; other factors to consider are the hours of operation, the number of operating rooms (ORs) available, the number of intensive care beds open, the number of days spent at each location, and supplies. Factors to consider for the outpatient workload include location, weather, population, and services required by the population. At some locations more patients were seen by fewer providers compared with other locations. This is a testament to the crew doing their best to care for as many patients as possible.

Table 10.
Surgical Patient Workload and Manpower

	Zamboanga	Jolo	Tawi-Tawi	Bangladesh	Simeulue	Nias	Banda Aceh	Tarakan	Kupang	Dili
# of surgical patients aboard Mercy	89	882	661	56	446	884	84	775	72	339
# of military providers	76	773	771	78	779	881	74	770	70	68
# of NGO	12	66	66	44	88	110	16	77	7	6
# of surgeries performed ashore	23	1113	776	153	55	88		5	20	11
Total surgeries at location	**112**	**1195**	**1137**	**209**	**551**	**92**	**75**	**880**	**92**	**40**

The next section examines the make up of the teams who conducted the various types of patient care in more detail.

Medical Outreach Teams

Outreach teams conducted traditional medical outreaches at various local sites. Teams ranged in size from 24 to 55 personnel, with an average team size of 44. Military personnel outnumbered civilian personnel on the medical outreach teams. Command and control personnel included the officer in charge, assistant officer in charge, logistics, communications, public affairs, biomedical repair technicians, and patient administration personnel.

Outreach teams consisted of the following functional areas and average number of staff:
- – Command and control   9 (medical & non medical)
- – Clinical   10
- – Pharmacy   3
- – Dental   6
- – Optometry   2
- – Immunizations   7
- – Project Handclasp   3 (non medical)
- – Force protection   4 (non medical)

Total personnel   44

Medical outreaches were not conducted every day. On days medical staff would go ashore to assist at a local hospital, the number of providers, medical specialties assigned, and type of services were based on the request of the local hospital. Table 11 shows the average number of personnel used to staff the various services requested by the HN's local hospitals. The number of staff assigned to each medical service varied each day. The number of days spent at each hospital is also reported in the table.

Table 11.
Average Number of Personnel Used to Staff HN Medical Treatment Facilities

SITE	MISSION	Days at mission	Clinical	Optometry	Dental	Prev Med	Training	BMET	Immuni-zations	Ancillary	C2	Total
Jolo	Sulu Hospital	6	5	2	2		5	4			4	**22**
	Camp Bautista	6	3	2	2	6					9	**22**
Tawi-Tawi	Bongao Hospital	5	7	2		5		3		2	6	**25**
Simeulue	RUSD Hospital	4	15	2	3	5	9	2	7	9	14	**66**
Nias	Gunnisitoli Hospital	4	17	3	5	6	7	3	9	7	12	**69**
Banda Aceh	Z. Abidin Hospital	6	9	2	3	3	5	2		2	11	**37**
	Kesdam Military Hospital	3	4	3	2	1				2	8	**20**
Tarakan	Tarakan Hospital	5	6			5	8	2	2	2	12	**37**
	TNI Military Hospital	5	4	2	2	6	5	2	2	2	7	**32**
Kupang	Police Hospital	1				2		2			4	**8**
	Johannes Hospital	5	9	2	3	5	6	2	5	4	12	**48**
Dili	Dili National Hospital	3				5		2			2	**9**
	Dan's Clinic	4	6	2	3	1	4	2		2	8	**28**

The clinical category in Table 11 includes the practitioners of various specialties—such as Orthopedics, Psychiatry, or Pediatrics—who went ashore. The ancillary category includes Pharmacy, Radiology, Physical Therapy, or Laboratory personnel. C2 personnel included officer in charge, public affairs, patient admin, and logistics personnel.

Military Provider Specialties

The following three tables show the military provider specialties. The providers were assigned to various divisions within the medical and nursing departments. The divisions in the medical department included Laboratory, Operating Room, Pediatrics, Preventive Medicine, Sick Call, and Radiology. Nurses were assigned to the following divisions: Casualty Receiving, Intensive Care Unit (ICU), Medical Planning, Nursing Administration, Operating Room, Training, and the Ward. This does not mean the personnel worked exclusively in their assigned division or they never went ashore, but it gives a sense of the various divisions on the ship.

Table 12 shows the nursing specialties of the US and foreign military personnel. In general, US active-duty nurses were not used as members of the medical outreach teams. They did however go ashore to the local hospitals to provide training. Overall, according to the administration database, 36 USN nurses, 1 USAF nurse, and 10 foreign military nurses (7 Filipino, 3 Indonesian) were deployed aboard the Mercy. The table shows the nurses' specialties: 6 critical care nurses, one emergency trauma nurse, 27 registered nurses (RNs); 7 perioperative nurses, and 2 nurse anesthetists.

The activity manning document (AMD) for the hospital ships at the 250-bed level calls for 21 critical care nurses, 13 emergency-trauma nurses, 29 RNs (the majority are medical-surgical), 13 perioperative nurses, and 4 nurse anesthetists for the primary mission. The focus of HA missions is more primary care and postsurgical care and less trauma care. The mix of nurse subspecialties for HA missions should reflect these skill sets.

Table 12.
US and Foreign Military Personnel Nursing Specialties

Nursing Specialty	NOBC	Deployed 2006	AMD 250 Qty
Education & Training	3215	1	1
Dir HS/Pgm/Nsg Admin	0904	1	1
Critical Care Nurse	0904	6	20
Dir HS/Pgm/CC Nrs/Ros Stf	0005	1	1
Clin Spec Nurse/Med-Surg	0925	0	2
Clin Spec Nurse	0925	0	1
Registered Nurses	**0944**	**27**	**29**
Staff Nurse/Med-Surg	0944	22	24
Staff Nurse/Psych	0944	1	2
Staff Nurse	0944	2	2
Community Health	0944	1	0
Maternal-Child Health	0944	2	0
Emergency-Trauma Nurse	0906	1	13
Pc Nurse Practitioner/FNP	0963	0	1

Pc Nurse Practitioner/OB	0963	0	1
Nurse Anesthetist	0952	2	4
Perioperative Nurse	0932	7	12
Total		**47**	**85**

The active-duty physician specialties deployed on *Mercy* mission are outlined in Table 13. Varying physician subspecialties were assigned to medical outreaches and local hospitals. Overall, 38 USN physicians and 6 USAF physicians deployed – the remaining 37 were foreign military personnel (9 Indian Armed Forces, two Malaysian, seven Australian, 9 Philippine Armed Forces, 3 Singapore, 5 TNI, 2 USPHS). *Mercy* mission increased the number of internists, pathologists, and dermatologists and added general practitioners and family practitioners. The number of surgeons and anesthesiologists were decreased. As with the nursing specialties, the mix of subspecialties and quantity of those specialties needs to be reassessed for future missions.

Table 13.
US and Foreign Military Personnel Medical Specialties

Physician Specialty	NOBC	Deployed 2006	AMD 250 Qty
Internists	**0101**	**9**	**6**
Internist General	0101	4	0
Internist/CC	0101	1	1
Internist/Pulm	0101	0	1
Internist/Neph	0101	0	1
Internist/Inf Dis	0101	3	1
Internist/Gastro	0101	0	1
Internist/Cardio	0101	1	1
General Practice Medical Officer	0102	2	0
Family Physicians	**0108**	**10**	**1**
Family Physician	0108	2	1
Family Physician/Pediatrician	0108	8	0
Dermatologist	0111	3	1
Psychiatrist	0115	0	1
Anesthesiologists	**0118**	**3**	**6**
Anesthesiologist/CC	0118	1	2
Anesthesiologist	0118	2	1
Anesthesiologist/ Neuro	0118	0	1
Anesthesiologist/C&T	0118	0	1
Anesthesiologist/Pain	0118	0	1
Neurologist/CC	0121	0	1

Radiologists	**0131**	**2**	**2**
Radiologist Diag/Imaging	0131	2	1
Radiologist Diag/Interven	0131	0	1
Pathologist	0150	2	1
Preventive Medicine	0163	1	0
General Surgeons	**0214**	**5**	**6**
General Surgeon/Trauma	0214	0	3
General Surgeon	0214	5	1
General Surgeon/Endoscopic	0214	0	1
General Surgeon/Vascular	0214	0	1
Neurosurgeon	0224	0	1
OB/GYN	0229	1	2
Ophthalmologist	0234	2	1
Orthopedic Surgeons	**0244**	**2**	**4**
Orthopedic Surgeon/Hand	0244	0	1
Orthopedic Surgeon/Trauma	0244	0	1
Orthopedic Surgeon	0244	2	1
Orthopedic Surgeon/Spine	0244	0	1
Otolaryngologist	0249	1	1
Plastic Surgeon	0254	1	1
C/Rectal Surgeon	0259	0	1
Thor & CDV Surgeon	0264	0	1
Urologist	0269	1	1
CDR/CO SHR ACT	9421	1	1
Unknown specialty		35	
Total		**81**	**39**

The types and quantity of corpsmen deployed on *Mercy* mission are displayed in Table 14. The AMD 250 column lists the number of each navy enlisted classifications assigned to the hospital ship. NGO personnel most likely will not replace the medical enlisted personnel. There are not equivalently trained personnel in the civilian sector for most of the specialties, and for the few areas where there is a civilian equivalent, there were no NGO volunteers for the most recent mission.

Table 14.
Medical Enlisted Personnel

Specialty	NEC	Deployed 2006	AMD 250-bed level
General Duty Corpsman	0000	79	137**
Cardio Tech	8408	1	1
Surface IDC	8425	4	7
Preventive Medicine Tech	8432	7	3
Ocular Tech	8445	1	1
Otolaryngology Tech	8446	1	2
Advanced X-Ray Tech	8452	4	15
Optician	8463	2	2
Physical Therapy Tech	8466	2	2
BMET	8478	8	12
Pharmacy Tech	8482	11	12
Surgical Tech	8483	13	26
Orthopedic Cast Tech	8489	2	3
Histopathology Tech	8503	1	1
Cyto Tech	8505	1	1
Med Lab Tech	8506	6	19
Respiratory Tech	8541	6	4
Dental Tech	8701	1	1
Dental Admin Tech	8703	1	1
Field Service Dental Tech	8707	1	
Dental Lab Tech	8752	2	1*
Training	9502	2	
Total		156	131

*AMD 250 calls for an advanced dental lab tech 8753. **AMD 250 calls for 201 general duty hospitalman/hospital corpsman. Food service positions account for 74 personnel, leaving 137 for patient care.

NGO Personnel

The number of active-duty staff was generally stable across the HA mission. Once the active-duty personnel embarked in Manila they generally did not disembark until all sites were visited. The NGO staff were noticeably different because the numbers fluctuated by location. Table 15 summarizes all NGO personnel by specialty.

Table 15.
Nongovernmental organization personnel specialties

	Aloha Medical Mission	Project HOPE	International Relief Team	Save the Children	TzuChi	Operation Smile	UCSD Pre Dental Society
Community Health Nurse		2	1	2			
ER Nurse		9	1		1		
OR Nurse	2	2	1		5		
ICU Nurse	2	2					
Nurse	1	5			4		
Nurse Midwife		1					
Family Nurse Practitioner		3	2				
Physician Assistant	1	1	1				
Pediatric Physician		2					
Family Practice Physician		1					
Internal Medicine Physician	1	4					
Emergency Medicine Physician		1	1				
General Physician	2	3					
OB/GYN		1					
Urologist	1						
General Surgeon	4	3	1				
Orthopedic Surgeon			1				
Plastic Surgeon		1					
Physical Therapist		1					
Pharmacist	1						
Dentist	1						
Ophthalmologist		1					
Anesthesiologist	4						
Occupational Therapist	1						
Psychiatrist	1						
Social Worker	1						
Specialty Unknown						37	10

This categorization helps determine which specialties are likely to volunteer for future missions, and which specialties might be staffed by NGO versus active-duty personnel. Medical/nursing specialties were determined from the embark sheets filled out once onboard *Mercy*.

Project HOPE worked aboard the hospital ships during deployments in 2005 and have ongoing missions across five continents. Project HOPE "is dedicated to providing lasting solutions to health problems, with the mission of helping people to help themselves." They had volunteers aboard *Mercy* throughout the deployment. The number of volunteers increased during the return to Banda Aceh, Nias, and Simeulue.

Aloha Medical Mission is an NGO with ongoing missions to "provide free and voluntary medical, surgical and other health-related services, supplies and equipment to medically

indigent areas of the Philippines, Southeast Asia, and the Pacific." They had personnel aboard *Mercy* for all sites except Tarakan. The personnel mix varied by location.

The International Relief Team (IRT) is an "internal relief organization dedicated to organizing volunteer teams to provide medical and non-medical assistance to victims of disaster and profound poverty worldwide." IRT joined *Mercy* for missions in Banda Aceh and Nias, which were locations where IRT volunteers responded after the tsunami in December 2004 and the earthquake in March 2005.

Save the Children "is an independent organization creating lasting change in the lives of children in need in the United States and around the world. They ensure that children can survive and thrive, and that their families, and communities have the resources and skills to enable them to do so." Two community health nurses joined *Mercy* from this organization.

Tzu Chi Foundation is a non-profit organization founded in Taiwan. It is a volunteer-based organization who focuses on giving material aid and inspiring love and humanity in both the givers and receivers. The foundation has dedicated itself in the field of charity, medicine, education, environmental protection as well as the promotion of humanistic values and community volunteerism. Ten nursing personnel joined *Mercy*.

The University of California, San Diego Pre-Dental society group had ten volunteers. Generally, 2 to 4 members of this group were aboard *Mercy* at each location. Operation Smile had 37 volunteers onboard *Mercy* for the mission in Bangladesh. Personnel check-in sheets were not available for Operation Smile and therefore, the number of volunteer nurses, surgeons, or anesthesiologists is unknown.

Staffing Recommendations

There is no "one size fits all" staff solution for HA missions. To plan appropriately, the mission requirements must be determined, which has been done for *Mercy* mission using the logical framework process discussed in the Approach section of this document. Humanitarian missions are not just about the number of patients seen; effective HA helps build the health care infrastructure so the nation can become self sufficient.

Staffing recommendations based on the mission requirements (direct patient care and capacity-building activities), the lessons learned from *Mercy's* tsunami relief, and 2006 HA missions and the analysis of patient and staffing data from 2006 HA mission, are presented for ashore and shipboard medical staff. This staffing recommendation outlines the minimum medical staff needed to perform an HA mission based on staffing ratios and lessons learned from the past two *Mercy* HA missions. The example includes all *Mercy* missions' elements—ashore, capacity-building, and shipboard personnel. The minimum military staff is detailed with the assumption that NGO and foreign military medical specialties will fill in the gaps. Once the initial inputs are determined, staffing is refined to meet the mission's expectations and goals.

The following assumptions about the shipboard capabilities were made to determine the required staff: 3 ORs, 15 Casualty Receiving (CASREC) beds, 4 ICU beds, and 60 Ward beds. To conduct a successful HA mission in this scenario, a minimum staff of 228 medical

and 288 nonmedical personnel would be required. The medical personnel would be composed of 24 physicians, two dentists, 42 nurses, 17 Medical Service Corps, and 143 hospital corpsmen.

Ashore Medical Staff

Direct Patient Care

There is no "required" number of personnel to deliver the ashore mission direct patient care. Typically, medical outreaches are performed by small medical teams composed of physicians, dentists, corpsmen, and pharmacy techs offering basic medical services on a first-come, first-served basis. In most cases, the number of people waiting for care far outweighs the number of patients seen. In planning a medical outreach team, the goal is not to see every person in line, but to provide "some" medical care to the local population. Triaging the waiting line is an approach that can maximize the care delivered to the local population. A medical outreach team can be scaled to whatever size resources permit. The number of personnel sent ashore by *Mercy* for medical outreach missions (on average 28 medical and 16 nonmedical) seems reasonable, but can be adjusted based on individual site assessments. NGO personnel can be used to deliver the direct patient care, although specialties such as dentistry, optometry, and pharmacy did not have many NGO volunteers. Military personnel will most likely continue to deliver care for these specialties. Military personnel will also be required for command, control (C2) and force protection.

The direct patient care personnel listed comprise the basic services provided during a medical outreach mission. It is assumed that general duty corpsmen assist the physicians and help with patient encounter documentation. If no immunizations are administered, then those additional personnel stay aboard the ship. The command and control personnel are active-duty personnel who may or may not be medical and include the officer in charge, assistant officer in charge, logistics, communications, and public affairs personnel.

Capacity-Building

The PM team can include a variety of personnel—an environmental health officer, entomologist, microbiologist, advanced lab technician, and PM technicians. The assumption is that the PM team is providing sanitation, vector control, and microbiology training. Therefore, the suggested 8 personnel will include 1 environmental health officer, 1 entomologist, 1 microbiologist, 3 PM technicians, 1 advanced lab technician, and 1 officer in charge. It is assumed a Seabee detachment consists of 15 personnel, based on the group that was previously assigned to *Mercy*. The number of personnel required for the capacity-building activities is dependent on the specific activities expected to be accomplished. PM services encompass a variety of possibilities from training, vector control, public health/communicable disease control, to environmental site assessments. Embarking a task-organized Forward Deployed Preventive Medicine Unit offers the personnel, equipment, and supplies to meet a broad spectrum of PM objectives. USPHS personnel are the best resource for assessing public utilities on location. NGO volunteers did not specialize in preventive medicine.

If the use of biomedical repair technicians is anticipated, then 2 to 3 technicians at a facility are optimum for completing a repair and/or installation. Military personnel are required for these missions.

The training personnel required will fluctuate with the expected number of classes and students. Courses such as BLS, ALS, and PALS have a specific instructor/student ratio. Having multiple certified instructors aboard gives the hospital ship flexibility in meeting requests for these classes. NGO personnel can be used to conduct training, but prior planning will be required.

Table 16 summarizes the staff requirements to conduct direct patient care and capacity-building activities during ashore missions.

Table 16.
Staffing Recommendations for Direct Patient Care and Capacity-Building Ashore HA

Ashore Activity	Number of Personnel
Clinical	10
Immunizations	7
Pharmacy	6
Dental	3
Optometry	3
Preventive Medicine	8
Training	4
BMET	3
Construction	15
Command and Control	9
Force Protection	4

Shipboard Medical Patient Care

Planning factors such as the services offered, the expected patient conditions, and time at the site help determine the necessary shipboard medical staff. The deployment length, transit time, and average length of stay at each site are also planning factors that may affect the quantity and type of staff embarked for the mission.

Transit time affects the number of personnel initially embarked. If transit time is greater than 14 days, a skeleton crew will staff the ship during transit, and the majority of the medical personnel will join the ship just prior to the first mission site. If transit time is less than 14 days, then the backfill costs for sourcing the MTFs versus transportation costs will need evaluation. The time at the site will affect the surgery types that can be performed due to recovery time. Nurse and physician staffing ratios associated with the different bed types are used to determine the patient care staff numbers.

Table 17 displays the staffing ratio of nurses, physicians, and hospital corpsmen for the various bed types aboard the hospital ship. Once the bed numbers for each functional area are determined, the required staff can be calculated. The ratios to establish the staffing numbers are shown in Table 18. A lesson learned from *Mercy* mission is that personnel should be dedicated to a discharge planning team during HA missions. This would give the discharged patients the consistent care they need during transport and transfers to follow-on care at local MTFs.

Table 17.
Shipboard Medical Staff/Bed Ratios

Department	Staff type	Ratio
CASREC	Nurses	1 per 4 beds
	Physician	1 per shift
	HM	1 per 2 beds
OR	Nurses	2 CRNA per anesthesia provider, 1 RN circulator, 2 periop per table
	Physician	1 anesthesia provider, 1-2 surgeons per table
	HM	2 surgical techs in CSSR and 2 techs in OR per table; 1 anesthesia tech per 2 anesthesia providers
ICU beds	Nurses	1 critical care nurse per bed per shift
	Physicians	1 provider, internal medicine or intensivist preferred
	HM	1 HM per bed per shift, 1 resp tech for ventilator mgmt per 2 beds, 1 HM for supply
Isolation Ward	Nurses	1 per shift
	HM	1 per shift
Ward	Nurses	1 med-surg nurse per 8 beds per shift
	HM	1 HM per 4 beds per shift, 1 HM for supply
Discharge Planning	Nurses	2 (1 on board and 1 at the boat landing zone)
	HM	5 (4 on board and 1 to travel with patients)

Table 18.
Shipboard Medical Staff/Bed Example

Dept	Number of beds	Nurses	Physicians/Allied Health Professional	HM
OR	3	4 CRNA, 3 RN, 6 Periop	6 general surgeons, 1 ophthalmologist, 2 anesthesiologists	12 surgical techs
CASREC	15	4	4	9 hm
ICU	4	8 Critical Care	1 physician intensivist	13 (1 supply, 4 resp techs, 8 gen duty)
Ward	60	16 nurses		27
Discharge Planning		2		5
Radiology			1 radiologist	3 rad techs
Pharmacy			2 pharmacists	7 pharmacy techs
Psych			1 psychologist	2 psych techs
Physical Therapy			1 physical therapist	3 PT techs
Lab			2-3 lab officers	11 (8 lab techs {3 blood bank, 2 micro, 3 general}, 2 histology techs, 1 cyto tech
Sick Call			1 physician	3

Historically, general surgeons will volunteer through NGOs, therefore the number of military general surgeons requested for HA missions can be reduced. Specialty surgeon requirements may not be met by NGO personnel. The number of surgeons required is dependent on the number of ORs open, the types of surgeries expected, and available supplies. Additional surgeons are needed to screen potential patients during the first few days at each site.

Another factor to consider when determining manning requirements is the operating hours of each functional area. The CASREC area will have limited operating hours during HA missions, therefore staffing does not require 24-hour coverage. On the other hand, ICU, Isolation, and Ward beds require 24-hour staffing. Coverage is broken into two 12-hour shifts.

The Radiology Department took chest x-rays of all the patients admitted to detect tuberculosis as well as performed other imaging techniques not available at HN MTFs.

Embarking a psych debriefing team was suggested by *Mercy* to help staff cope with any patient deaths and the difficulty of leaving a location where many people will continue to suffer from the lack of available medical care. This would be a new addition, since there have not been psych teams on previous HA missions.

The physical therapy staff provided services for *Mercy* crew members and patients, and went ashore to conduct training.

During the last two missions, *Mercy* has traveled to locations that have a high tuberculosis incidence. This can be a burden if the laboratory is not adequately staffed. The manning suggestions are based on the experience of *Mercy* lab officer. A pathologist is included in the suggested quantity of lab officers. Planning for the lab staff should include the expected needs for disease testing and routine surgical screenings.

Table 19 displays the specialty mix for physicians, nurses, and corpsmen. For future missions, the specialty mix of surgeons and medical providers should be tailored to the mission goals and objectives. The available NGO medical providers will also affect the mission's capabilities. The table below states the minimum military personnel for nursing and physician specialties based on department head and division officer positions.

Table 19.
Staffing Recommendations – Medical Specialties

	Designator/ NEC	Total Quantity	Minimum Military		Designator/ NEC	Total Quantity	Minimum Military
Physicians	2100			Medical Technology		1	1
Family Practice		3	1	Microbiology		1	
Pediatrician		2		Physical Therapy		1	1
Internal Medicine		6	2	Clinical Dietetics		1	
OB/GYN		1		Optometry		2	
General Surgeon		6	1	Psychologist		1	
Ophthalmologist		1		Supply		1	1
Orthopedic Surgeon		1	1	**Medical Enlisted**	HM		
Anesthesiologist		2	1	General Duty Corpsman	0000	68	
Radiologist		1	1	Surface IDC	8425	3	
Pathologist		1	1	Preventive Medicine Tech	8432	6	
Dentists	2200	2	1	Ocular Tech	8445	1	
Nurses	2900			Advanced X-Ray Tech	8452	3	
Critical Care		8	3	Optician	8463	2	
Perioperative		6	3	Physical Therapy Tech	8466	3	
Medical Surgical		20	4	BMET	8478	10	
ER-Trauma		2	1	Pharmacy Tech	8482	12	
Nurse Anesthetist		4	2	Surgical Tech	8483	12	
General Nurse		2	1	Orthopedic Cast Tech	8489	1	
Medical Services	2300			Histopathology Tech	8503	2	
Pharmacist		3	1	Cyto Tech	8505	1	
POMI		1	1	Med Lab Tech	8506	8	
Patient Admin		2	1	Respiratory Tech	8541	4	
Entomologist		1		Dental Tech	8701	4	
Environmental Health		2		Dental Lab Tech	8752	1	
				Psych Tech	8485	2	

Table 20.
Staffing Recommendations – Support Staff

Department/Division	Quantity	Department/Division	Quantity
Supply		**Admin**	
Supply Officers	4	Admin Officers	3
Culinary Specialists	32	Personnelman	6
Store Keepers	25	Yeoman	8
Ships Handlers	24	Chaplain	3
Postal Clerk	2	Legal	2
Personnelman, disbursing	3	Security	13
MTF Command Suite	4	Public Affairs	6
Construction Detachment	15	Communications	30
Security Detachment	51	Operations	24
		Air Detachment	33

The total support personnel count reflected does not include civilian mariners or phibron staff. Air, security, and construction detachment personnel numbers are based on *Mercy's* 2006 mission.

Conclusions

To plan HA operations appropriately, the mission requirements must be known. Drifmeyer's Logical Framework Process should be used to formally plan the mission and determine the important goals, objectives, activities, inputs, and results. This information includes such variables as the ship platform, expected patient conditions, and time at the site, which constrains the possible medical interventions, determines the appropriate medical specialties, and has an impact on the necessary support staff. It is important to acknowledge that effective HA helps build the HN's healthcare infrastructure, thereby allowing the nation to become self-sufficient.

To plan a relevant HA mission, research into the expected HNs must be conducted. This crucial information will give planners insight as to what specialties will be needed, what types of training will be most valuable, and what types of surgeries will have a lasting impact on the HN populations. Capacity-building exercises including training, repair, construction, and site assessments will provide lasting skills and equipment to the HN medical providers. This, in turn, will allow the HN populations to receive higher quality medical care in the future.

NGO personnel can fill many of the nursing and physician requirements as long as the appropriate specialties volunteer to meet the mission goals. The hospital corpsman requirements will not be replaced by NGO personnel. Military medical personnel will remain in each of the functional areas to provide leadership, continuity, and other duties that cannot be supported by NGO personnel, such as administrative tasks. At a minimum, military personnel are needed as department heads for the medical, nursing, and surgical departments. Military personnel should also fill division officer positions within the departments such as ICU, CASREC, Ward, Sick Call, Radiology, and Dental.

The partnership of the hospital ships with NGOs allows both parties to achieve their missions. The hospital ship provides goodwill and a US presence, and the use of NGO personnel eases the burden on the military medical personnel demands. For the NGOs, the partnership is an opportunity to provide the medical benefits for which they are known to the communities they currently serve and add some new ones.

The LFP requires that mission leaders provide assistance, assessment, and measurement of the mission's success once the HA deployment is complete. These valuable steps will allow further refinement of the staffing and supply estimations outlined in this document. A Web-based resource center is needed to assist in the assessment and measurement of the mission success. The resource center should contain a "tool set" of templates to assist in needs-based planning for medical HA/DR missions, and a template for recording detailed after-action reports and medical lessons learned. The recorded planning and after-action information can then be used to assess an HA mission. Only with a continued commitment to planning and improvement will future missions avoid the pitfalls and inevitable mistakes common to newer deployments like HA/DR operations.

Acknowledgement

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Appendix A.

USNS *Mercy* TSCP Patient Care Sheet

USNS *Mercy* TSCP Patient Care Sheet   Provider: _____

Date: __/__/__ Pat. ID#:_____ (DD/MM/YY)	Location:	Weight:_____ Height:_____ (kgs / lbs) (cm / in)
Name _____ Age ____ Sex: ☐ Female Parent/Guardian: _____ ☐ Male		Temp: _____ BP_____/_____ Resp:_____ HR_____

	Norm	Abn	N/A	**Complaint:**
Head/Neck	☐	☐	☐	
Cardio	☐	☐	☐	**Abn Findings/Remarks:**
Pul/Thorax	☐	☐	☐	
Abdomen	☐	☐	☐	
Skin	☐	☐	☐	
Extremity/MS	☐	☐	☐	
GU/Pelvic/Rectal	☐	☐	☐	
Neuro	☐	☐	☐	
Other:_____	☐	☐	☐	**Assess. & Plan:**

PROC.	☐ **RX** ☐ **Measles Immunization** ☐ **Other Immunization** ☐ **Splint/ Cast** ☐ **U/S** ☐ **Card. Echo.** ☐ **Wound Care** ☐ **I&D** ☐ **Skin BX** ☐ **Labs** ☐ **Suturing/closure** ☐ **Other (list):**
GEN	☐ Anemia ☐ Dehydration ☐ Malnutrition ☐ Obesity ☐ Vitamin Def. ☐ Adverse Drug Rxn ☐ Vaccine Rxn ☐ Other (list):
HEENT	☐ Allergies ☐ Foreign Bodies ☐ Hearing Loss ☐ URI/viral syndrome ☐ Otitis Externa ☐ Otitis Media ☐ Sinusitis ☐ Vertigo ☐ Blurred Vision ☐ Cataract ☐ Conjunctivitis ☐ Eye Foreign Body, External ☐ Eye Pain ☐ Glaucoma ☐ Presbyopia ☐ Pterygium ☐ Visual Disturbance ☐ Visual Loss ☐ Goiter ☐ Hyperthyroidism ☐ Hypothyroidism ☐ Other (list):
PULM	☐ Asthma ☐ Bronchitis ☐ Cough ☐ Dyspnea ☐ Pneumonia ☐ URI ☐ Reactive Airways Dis. ☐ Other (list):
CV	☐ Angina ☐ Arrhythmia ☐ Chest Pain ☐ Congestive Heart Failure ☐ Hypertension ☐ Hypotension ☐ Murmur ☐ Palpitations ☐ Rheumatic Fever ☐ Rheumatic Heart Dis. ☐ Syncope ☐ Valvular Disease ☐ Other (list):
GI	☐ Abdominal Pain ☐ Constipation ☐ Diarrhea/gastroenteritis ☐ Dyspepsia ☐ Dysphagia ☐ GERD ☐ Other (list)
GYN	☐ Amenorrhea ☐ Dysfunct. Uterine Bleeding ☐ Menopausal Dis. ☐ Pregnancy ☐ Vaginitis / Vulvitis ☐ Other (list):
MUSC/ SKEL	☐ Arthritis ☐ Degenerative Joint Disease ☐ Fracture ☐ Gout ☐ Joint Pain ☐ Lower Back Pain ☐ Muscle Pain ☐ Osteoporosis ☐ Sprain ☐ Strain ☐ Tendonitis ☐ Contracture ☐ Other (list):
SKIN	☐ Abscess / Carbuncle ☐ Cellulitis ☐ Contact Dermatitis ☐ Dermatitis, Unspec. ☐ Eczema ☐ Folliculitis ☐ Heat Rash ☐ Impetigo ☐ Insect bite(s) ☐ Lice ☐ Pruritus ☐ Psoriasis ☐ Pyoderma / Furunculosis ☐ Scabies / Pediculosis ☐ Tinea ☐ Warts ☐ Other (list):
NEUR/ PSY	☐ Anxiety ☐ Ataxia ☐ Delirium/Psychosis ☐ Depression ☐ Dysphasia/Aphasia ☐ Insomnia ☐ Paralysis /Paresis ☐ Seizure Dis. ☐ Sensory Deficit ☐ Stress Reaction ☐ Other (list):
TRAU-MA	☐ Abrasion ☐ Burns ☐ Contusion/ Ecchymosis ☐ Head Injury ☐ Heat Exhaustion. ☐ Heat Stroke ☐ Laceration ☐ Poisoning ☐ Puncture Wound ☐ Other (list):
MISC	☐ Allergic Reaction ☐ Diabetes Mellitus ☐ Epilepsy ☐ Fever ☐ Malaise / Fatigue ☐ Immune Compromised ☐ Other (list):

INF. **DIS.**	☐ Chicken Pox ☐ Dengue Fever ☐ Vag. Candidiasis ☐ Giardia ☐ Gonorrhea ☐ Hepatitis ☐ Influenza ☐ Helminiths ☐ Leishmaniasis ☐ Malaria ☐ Measles ☐ Mumps ☐ Rubella ☐ Trichomoniasis ☐ Tuberculosis ☐ Typhoid ☐ Non-GC Urethritis ☐ Syphilis ☐ Other (list):

Date: _____ **Patient ID#:** _____

Location:

Parent/Guardian:

Name _____ **Age** _____ **Sex:** ☐ Female ☐ Male

Vital Signs (if applicable)

Complaint:

Assessment:	Yes	No
Abscess/Infection	☐	☐
Caries	☐	☐
Endodontic	☐	☐
Gingivitis/Periodontal	☐	☐
Oral Ulcers	☐	☐
Pericoronitis	☐	☐
Other:		

Procedure:

☐ Extraction

☐ Dental Hygiene Education

☐ Other (list): _____

Notes:

Provider:

USNS *Mercy* TSCP Optometry Patient Care Sheet

Date: _____ **Patient ID#:** _____

Location:

Name _____ **Guardian/Parent:** _____ **Age** _____ **Sex:** ☐ Female ☐ Male

Treatment:

☐ Reading Glasses   ☐ Distance glasses

☐ Eye Ointment   ☐ Eye Drops

☐ Referral to ship

☐ Other (list):

Notes:

Provider:

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The primary mission of the hospital ship is to provide acute medical and surgical services to forces ashore and afloat during military operations. In addition, the hospital ship also has the mission of providing a hospital asset in support of disaster relief and humanitarian assistance (HA) operations. This secondary mission provides medical care to a different population with a set of medical conditions not common to combat casualty care, thus affecting the manning requirements.

Information from a variety of sources was used to better understand humanitarian missions conducted by the hospital ships. Factors such as time on site, security threats, and location characterize the mission. Patient encounter data from previous missions were used to determine expected patient conditions encountered in various HA operations. Support task information was gathered from subject matter experts. These data points were used to project the medical and support tasks required for future missions.

To accomplish a successful HA mission, the operational requirements and goals must be set ahead of time. The expected patient conditions and the time at each site, determine the best medical specialties to embark. Humanitarian missions accomplish more than just the number of patients seen—effective HA helps host nations become self-sufficient.

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